5-9 Complex Numbers

$\sqrt{-1} = i$

$i^2 = -1$

Simplify.

$\sqrt{-5}$ $\sqrt{-25}$ $\sqrt{-50}$ $\sqrt{-28}$

$i\sqrt{5}$ $5i$ $i\sqrt{50}$ $5i\sqrt{2}$ $2i\sqrt{7}$

i^{17}

$i \cdot i^{16}$

$i(i^2)^8$

$i(-1)^8$

i

i^{46}

$(i^2)^{23}$

$(-1)^{23}$

-1

i^{29}

$i \cdot i^{28}$

$i(i^2)^{14}$

i

Multiplication

ex:

$-3i \cdot 2i$

$-6i^2$

6

Must simplify 1st!

ex:

$\sqrt{-12} \cdot \sqrt{-2}$

$i\sqrt{12}$ $i\sqrt{2}$

$2i\sqrt{3} \cdot i\sqrt{2}$

$2i^2\sqrt{6}$

$-2\sqrt{6}$

ex:

$\sqrt{-4} \cdot \sqrt{-25}$

$2i \cdot 5i$

$10i^2$

-10

ex:

$\sqrt{-3} \cdot \sqrt{-27}$

Add and Subtract

ex:

$\sqrt{-16} - \sqrt{-49}$

$4i - 7i$

$-3i$

ex:

$i\sqrt{2} + 3i\sqrt{2}$

$4i\sqrt{2}$

Solve.

$5y^2 + 20 = 0$

$5y^2 = -20$

$\sqrt{y^2} = \sqrt{-4}$

$y = \pm 2i$

Cannot leave *i* in the denominator

$\frac{2}{3i} \cdot \frac{i}{i} = \frac{2i}{-3}$

ex:

$\frac{6}{\sqrt{-2}} = \frac{6}{i\sqrt{2}} \cdot \frac{i\sqrt{2}}{i\sqrt{2}}$

$\frac{6i\sqrt{2}}{-2} = -3i\sqrt{2}$

Complex Numbers

a + bi where a, b $\in$ R

ex: $5+2i$

Pure imaginary number

bi where b $\neq 0$

ex: $3i$

ex:

$(3 + 6i) + (4 - 2i)$

$7 + 4i$

ex:

$(3 + 6i) - (4 - 2i)$

$-1 + 8i$

ex:

$(3 + 4i)(5 + 2i)$

$15 + 6i + 20i + 8i^2$

-8

$7 + 26i$

ex:

$(8 + 3i)^2$

ex:

$\frac{(4 - 3i)}{(2 - 4i)} \cdot \frac{(2 + 4i)}{(2 + 4i)}$

$\frac{8 + 16i - 6i + 12}{4 - 16i^2} = \frac{20 + 10i}{20}$

$\frac{2 + i}{2}$

"Fun with Factoring"

$x^2 + 8$

Hw
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